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On Existence of a Critical Period for Language Acquisition

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Abstract: This study reviews research on first and second language acquisition to analyze what is regarded as supporting evidence for the 'critical period hypothesis'. It was revealed that (1) there is no hard evidence that language acquisition does not take place before age 2, (2) language acquisition appears to continue on well into adulthood, not ceasing at puberty, (3) theories based on cerebral lateralization does not seem relevant to critical period hypothesis on the grounds that lateralization is established around age five, according to Krashen (1973), and (4) evidence drawn from American Sign Language studies is difficult to distinguish whether it is due to purely linguistic cause or auditory.

Key words: critical period, language learning, first language acquisition, second language acquisition

1. Introduction

'Critical period' is a term used in biology to refer to a limited phase in the development of an organism during which a particular activity or competency must be acquired if it is to be incorporated into the behaviour of that organism (Singleton, 1989). It is known that a white-crowned sparrow must hear songs in the first 10 to 50 days of its life, to produce the proper songs as an adult. There is partial learning if the songs are presented between 50 and 100 days, but no learning before 10 or after 100. Applying this to language acquisition, the critical period could be defined as the period (1) prior to which human-beings cannot learn languages; and (2) during which human-beings must acquire languages (at least one) otherwise it would be impossible to do so because the critical period does not allow language acquisition to continue beyond this time.

This essay is to show that there is no such period as the 'critical period' for language acquisition by drawing evidence from studies on first and second language acquisition.

2. Evidence Related to Both First and Second Language Acquisition

Penfield (1963: 118) introduced the notion that the time constraints on animals might explain human constraints on language learning - there is an optimal age when certain specialized areas of the cerebrum are plastic and receptive. Looking into age and recovery from traumatic aphasia cases, Lenneberg (1967) claimed that cerebral lateralization completes at around puberty, by when the right hemisphere's involvement in language faculty increasingly fades away. He linked this to language acquisition, hypothesizing that there is a biologically programmed timetable for language learning, which does not begin before age two because of maturational factors, and which ends at puberty when cerebral dominance completes (= critical period hypothesis, 'CPH' henceforth).

Lenneberg further mentioned that second language learning is possible after puberty because "natural languages tend to resemble one another in many fundamental aspects and the matrix for language skills from first language is still present" (1967 :143), although foreign accents are almost inevitable. Supporting this line of argument are Hepworth and Wuillemin et al. Hepworth (1973: 281) supports Lenneberg's matrix theory in two perspectives: firstly with "the sequence of primary-language learning is applicable to second-language learning if the second language is learned during the critical period", and secondly "it seems that the critical period is important for second-language learning in that a matrix of language skills is fixed by the end of the period". Wuillemin et al (1994: 620) conducted experiments on right hemisphere involvement in processing late-learned languages with multilingual Papua New Guineans and found a strong influence of acquisition age on cerebral laterality for language and proficiency.

However, Krashen's (1973) rigorous reexamination of Lenneberg's data disclosed the fact that the strength or involvement of the right hemisphere in children older than five is as little as during adulthood. Citing Basaer (1962) and White's (1961) data that indicates hemispheric transfer is possible just up to five, he argued that lateralization is established around age five and "while a critical period may exist, its neurological substrata is not the development of lateralization". This argument runs counter to Lenneberg's CPH in language acquisition, which takes the stance that the period begins at age 2 and lasts till puberty, based on cerebral plasticity and lateralization.

As for Lenneberg's comment on second language acquisition influenced by first language matrix, Chomsky takes a similar stance that every language shares universal properties of language considered to be innate (Universal Grammar) and that the ability to learn a second language is only limited by increasing age and the loss of adaptability and inability for

reorganization in the brain (parameter-setting). In line with this Universal Grammar, Johnson and Newport (1991) conducted a study on second language acquisition - English universal principle subjacency - with native Chinese speakers, aged 4 to 36. The results showed that (a) maturation deeply affects the ability to reset the parameters, (b) some declines in the ability to learn language start as early as 4-7, with increasingly pronounced effects up to adulthood, and (c) there appears to be some residual ability to learn even during adulthood. The second and third findings are obviously counter-evidence for CPH.

Thus the arguments based on lateralization and Universal Grammar seem to end up with counter-evidence for CPH. Because lateralization, according to Krashen, seems to end at age 5 and availability of Universal Grammar, according to Newport, begins to decrease around the same age but some residual ability can be seen even during adulthood, while CPH claims that the period starts at age 2 and lasts till puberty, after which period acquisition of native-like fluency is not possible.

3. Evidence Related to First Language Acquisition

The most frequently cited evidence supporting CPH in terms of first language acquisition seems to derive from the American Sign Language (ASL) development of deaf children.

Marcotte and Morere (1990) studied speech lateralization in normal and deaf adolescents with variables strictly controlled. The results showed left hemispheric dominance for speech productions with subjects with normal hearing and deafness acquired after age 3, whereas atypical, anomalous cerebral representation was observed in both congenitally deaf and those with an early acquired deafness (onset 6-36 months). The researchers concluded that the speech lateralization seems to complete at age three, thus the critical period is between birth and three, in which period some proper stimulation must be given to the left hemisphere for language development later in life. This marks a sharp contrast to Lenneberg's CPH that the language acquisition process switches on around age two and that plasticity continues on till puberty.

The researchers further commented on the results "Whether the precise component of this early environmental deprivation leading to cortical reorganization is auditory or linguistic in nature remains unsolved." This implies that evidence for CPH drawn from the cases in deaf population is hard to distinguish whether it is due to linguistic or auditory causes. Thus any findings from ASL studies could not be used as supportive of CPH from a purely linguistic viewpoint.

Children's sign language acquisition was explored by Mayberry and Eichen (1991). After

unconfounding age of acquisition from length of experience, Mayberry and Eichen concluded "When the sensory and motor channels of language reception and transmission are switched to visual and manual ones (from the auditory and oral ones), the effects associated with the timing of language acquisition are neither circumvented nor diminished". Thus they supported Lenneberg's hypothesis that language acquisition is a developmentally time-locked phenomenon. It is true that the results indicate the linear characteristics of ASL acquisition which diminish with age. However, they failed to show a total disappearance of the ability to learn it after puberty. Therefore it is not impossible for the congenitally deaf who are not exposed to any spoken or sign languages till after puberty, to acquire ASL.

Another study related to first language acquisition is a rather unique CPH based on a computer-simulated evolution model by Hurford (1991). In this model, the language faculty is regarded as adaptive, favoured by natural selection for both reproduction and survival, while the critical period arises from the interplay of genetic factors influencing life-history characters in relation to language acquisition. Hurford input various plausible conditions under which the simulations were carried out. Implemented on a computer, the evolutionary model clearly showed critical period effects, which end around puberty. However, the experiment is vulnerable to criticism in that firstly the model is thoroughly hypothetical, not based on results conducted from 'real life' experiments. Secondly some of the pre-input conditions are highly unlikely, as seen in the 'mother' condition, for example, where an individual acquires language through his/her lifetime only from a single designated parent and once that parent dies s/he is incapable of acquiring any more. The third criticism is the way Hurford interpreted the results, such as the end of the critical period being "a point where the selection pressure in favour of facilitating factors ceases to operate, because of success at earlier life stages".

Producing offsprings is interpreted by Hurford as one of the elements for CPH, which stance is shared by other researchers such as Scovel, who arguers that "the end of the critical period is when humans are sexually prepared to contribute to the gene pool, and so it is imperative that by this point the individual is capable of acquiring accentless speech and distinguishing mates who might enhance the chances of future genetic success from those who might inhibit those chances" (1988:80). However that was not where the two researchers completed their arguments. Hurford continued "if humans underwent language-impairing brain damage frequently throughout their lives, but without actually dying, there would be selection pressure for capacity to regenerate language at later life stages." This leaves some room for language learning to (re-)emerge after puberty under certain conditions. As for

Scovel, he concluded "the evidence has been indirect and our logic has been necessarily inferential", implying only weak and limited support for CPH.

The major supporting evidence for CPH is that ability to acquire a first language declines linearly with age, but the complete disappearance of the ability after puberty has not been demonstrated.

4. Evidence Related to Second Language Acquisition

Some positive evidence for CPH seems to come from phonology, taking the stance that unless exposure to the second language begins before puberty, an authentic native-like accent in the target language will not normally be acquired (Seliger 1978, cited in Singleton: 107). Studying the integration of Italian immigrants in an English-speaking environment, Oyama (1975) concluded that the younger arrivals perform in the range set by the control group of native English speakers, whereas those arriving after about age 12 do not, and substantial accents start appearing much earlier. Oyama cited Krashen's survey of self-reported accent and age of beginning the second language: if learning begins before age 11 or so, accents are rare, between 11 and 15 they are not uncommon, and after 15 they are virtually universal. Similar negative correlation between age and auditory achievement was drawn from Tahta et al (1981a, cited in Singleton), Tomaszczyk's (1981) and Patkowski (cited in Hatch 1983:). Contradictory results come from the Snow and Hoefnagel-Hohle study on pronunciation of Americans learning Dutch (1978, cited in Hatch), showing that the rate of acquisition favours older learners in the beginning stages of learning but that these differences lessen out with the length of residence. Ekstrand (1978a, cited in Singleton) found linear improvement with age on pronunciation and listening comprehension with FLES (American studies of the effects of programmes of foreign languages in the elementary school) pupils. Tremaine (1975, cited in Singleton) argued that French aural comprehension amongst early total immersion pupils correlated with cognitive maturity. Blank & Keislar (1966, cited in Singleton) contended that kindergarteners took longer than fifth graders to learn to speak correctly the French utterances used in an individualized foreign language programme. Summarizing these discrepant arguments would be (1) children might be better than adults in the long run while adults could be better initially, and (2) younger children are not necessarily better than older children and vice versa. Despite these contradictory arguments, it could be safely said that there is no hard evidence to show that it is impossible to acquire a native-like accent after puberty.

Studies have been conducted in other linguistic areas such as syntax, morphology, and lexicology as well. Yamada et al (1980, cited in Singleton:83) conducted an experiment with

30 Japanese elementary school pupils on their success in learning English words in a formal instruction situation. They eliminated variables such as previous exposure to English, and found that "mean learning scores decrease with age; the older the age the lower the score". Ramsey & Wright (1974, cited in Singleton: 84) argued "For students who arrived in Canada at the age of seven or older, there is a clear negative relationship between age on arrival and performance in lexical and syntactic knowledge". But these findings were re-analyzed by Cummins (1980), who controlled the length of residence. He found little effect from the age of arrival as an advantage for older learners. Thus it is difficult to firmly claim the younger children's advantage over older children and adults in these linguistic areas as well.

With the focus shifting away from formal education and experimental situations, there are two longitudinal studies of two adults learning second languages in a naturalistic environment. The first case was reported by Ioup et al (1994) about an adult learner of Egyptian without any formal instruction. The results showed that she successfully acquired native proficiency, although it was pointed out that it remains to be answered (1) whether people who are capable of acquiring native-like proficiency in second languages after puberty use the L1 acquisition system or an alternative system and (2) why adults, unlike children, appear to require conscious attention to grammatical form. Another case study came from Schmidt (1983) on a Japanese adult learner of English. After being in an untutored situation for 3 years, he showed great improvement in sociolinguistic, discourse, and strategic competence which has made several sociolinguists comment he is a good language learner, whereas in grammatical competence he showed little improvement and interest to the extent that grammar teachers consider him a disaster possibly beyond rescue. Schmidt ascribed his lack of progress in grammar to the possibly insufficient length of observation period (grammar might eventually surge out), lack of ego-permeability, and learning characteristics. These cases are clear counter-evidence for CPH in that foreign language acquisition occurred even after puberty in a naturalistic environment, although proficiency level was dependant on the individual.

One of the reasons for contradictory results from SLA studies seems to be that too many different factors are intermingled together, resulting in the inability to single out one from the rest. In other words, (1) variables are not strictly controlled, (2) terms such as motivational, social, psychological, and communicational factors are not defined clearly enough, and (3) most studies focus on periods just before, during and immediately after puberty - not enough longitudinal follow-up studies to enable researchers to assess ultimate language

performance. Unless these problems are solved, no evidence could be claimed decisively for CPH.

5. Conclusion

This essay has analyzed what is regarded as supporting evidence for CPH in language acquisition and revealed that (1) there is no hard evidence that language acquisition does not take place before age 2, (2) language acquisition appears to continue on well into adulthood, not ceasing at puberty, (3) theories based on cerebral lateralization does not seem relevant to CPH on the ground that lateralization is established around age five, according to Krashen (1973), and (4) evidence drawn from ASL studies is difficult to distinguish whether it is due to purely linguistic cause or auditory.

Advantages arising from language acquisition at an early age might rest on the fact that it allows a longer exposure to the language, starting at a time when s/he has only to acquire a small quantity of language to attain native-like competence. It is true that social, cognitive and affective variables might affect some process of language acquisition, especially second language acquisition by adult learners, however these factors must be defined explicitly enough to be measurable before claiming their involvement in language acquisition.

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